CLAIMS

We claim :

1. In a digital communications system including a first modem operatively connected to a second modem through a digital communications network with possible digital impairments of repetitive nature, with repetition frame (RF) size of one or more slots, said first modem including pad detection means for detecting and measuring an actual value of programmed attenuation (PAD) in the digital trunk , a PAD and CODEC detecting means for detecting the type of Network CODEC at the digital trunk to analog loop interface in the signal path from the second modem to the first modem, said PAD and CODEC detection means comprising:

a. means for selecting a plurality of test values, where each said test value corresponds to a PAD value;

b. means for selecting a one or more CODEC types, each of said CODEC types corresponding to a particular CODEC type at the digital to analog interface at the network;

c. means for calculating a minimum error between preprocessed received signal values and the type of CODEC linear values for a test PAD value;

d. means for calculating a PAD estimate based on the minimum error; and

e. means for identifying CODEC type based on minimum error.

2. The PAD and CODEC detection means of claim 1, further comprising:

means for iteratively selecting PAD test values until an optimum minimum error is found.

3. The PAD and CODEC detection means of claim 1, further comprising:

means for storing a plurality of PAD values corresponding to different time slots in a repetition frame; and

means for grouping the PAD values into bins of similar values and using the average of the PAD values in the most populated bin to form the PAD estimate.

4. The PAD and CODEC detection means of claim 1, further comprising:

means for storing a plurality of minimum errors corresponding to different time slots in a repetition frame for a plurality of CODEC types;

means for summing the minimum stored errors for each type of CODEC; and

means for selecting a CODEC type having a lowest summed minimum error.

5. The PAD and CODEC detection means of claim 4, wherein the CODEC is of type standard complaint mu-law or A-law encoding.

6. The PAD and CODEC detection means claim 1, wherein the CODEC is of type D4 channel bank CODECs specified in AT&T Technical Reference, PUB 43801, November 1982, said PAD and CODEC detection means further comprises means for detecting the CODEC, by finding a error maxima at the PAD estimate in the Robbed Bit Signaling (RBS) time slot.

7. The PAD and CODEC detection means of claim 1, wherein the summed absolute error is determined according to the equation:

$$Error_n = \frac{\sum_{n=Ucode72}^{Ucode105} \left| ReceivedSample_n \cdot TestFraction - SLICED \left[ReceivedSample \right. \right.}{TestFraction}$$

for mu-law or A-law CODECs or type D4 channel bank CODECs specified in AT&T Technical Reference, PUB 43801, November 1982.

8. The PAD and CODEC detection means of claim 1, further comprising:

preprocessing means for preprocessing the received signal corresponding to minimizing correlative analog impairments, averaging noise and compensating for harmonic distortion.

9. The PAD and CODEC detection means of claim 1, further comprising means for maintaining data integrity of receive values in different time slots with repetitive digital impairments using a reference symbol, training symbol interleaving method, and updating adaptive loops and Decision Feedback Equalizer (DFE) pipe during reference symbols reception periods and freezing the

adaptive loops, and updating the DFE using the received values in the training symbols reception periods.

10. A method of operating a first modem operatively connected to a second modem through a digital communications system with possible digital impairments of repetitive nature, with repetition frame (RF) size of one or more time slots, to measure communications system pad and the network CODEC type at said first modem for signals sent from said second modem, said method comprising the steps of:

selecting a test PAD value,

selecting a CODEC type,

carrying out at said first modem a calculation of summing absolute errors between average received values multiplied by said test PAD value and the nearest CODEC linear values for the CODEC type,

selecting a minimum absolute error based upon said calculation,

calculating a PAD estimate based on said minimum absolute error, and

identifying a network CODEC.

11. The method of claim 10, wherein said step of summing absolute errors is repeated by selecting a test PAD values iteratively to find said minimum error.

12. The method of claim 10, further comprising the steps of:

storing a plurality of PAD values corresponding to different time slots in a repetition frame, and

grouping the PAD values into bins of similar values and using the average of the PAD values in the most populated bin to form the PAD estimate.

13. The method of claim 10, further comprising the steps of:

storing a plurality of minimum errors corresponding to different time slots in a repetition frame for a plurality of CODEC type,

summing the minimum stored errors for each type of CODEC, and

selecting a CODEC type having a lowest summed minimum error.

14. The method of claim 13, wherein the CODEC type is standard mu-law or A-law encoding.

15. The method of claim 10, wherein the CODEC is of type D4 channel bank CODECs specified in AT&T Technical Reference, PUB 43801, November 1982, said method further comprising the step of detecting the CODEC by finding a error maxima at the PAD estimate in the Robbed Bit Signaling (RBS) time slot.

16. The method of claim 10, wherein the impairment repetition frame size is selected from 6 or 12 or 24.

17. The method of claim 10, wherein a first test PAD fraction is selected to have a value of 1.0, and is incremented to a value of .25, for repeated calculations of summing absolute errors.

18. The method of claim 10, wherein the summed absolute error is determined according to the equation:

$$Error_n = \frac{\sum_{n=Ucode72}^{Ucode105} \left| ReceivedSample_n \cdot TestFraction - SLICED\left[ReceivedSample \right. \right.}{TestFraction}$$

for mu-law or A-law CODECs or type D4 channel bank CODECs specified in AT&T Technical Reference, PUB 43801, November 1982.